REMARKS

Applicant requests favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 21-26 are presented for consideration. Claims 21, 25 and 26 are independent. Claims 21, 25 and 26 have been amended to clarify features of the subject invention. Support for these changes can be found in the original application, as filed. Therefore, no new matter has been added.

Applicant requests favorable reconsideration and withdrawal of the rejection set forth in the above-noted Office Action.

Claims 21-26 were rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 6,633,362 to Murakami et al. Applicant submits that the cited art does not teach or suggest many features of the present invention as previously recited in claims 21-26. Therefore, these rejections are respectfully traversed. Nevertheless, Applicant submits that independent claims 21, 25 and 26, for example, as presented, amplify the distinctions between the present invention and the cited art.

In one aspect of the present invention, independent claim 21 recites an exposure apparatus for exposing a substrate with a pattern of an original. The apparatus includes a projection optical system for projecting the pattern of the original onto the substrate with light from a light source, an optical path difference applying optical system for dividing light from the light source into two light beams and for re-combining the two light beams, and an interferometer for measuring an optical characteristic of the projection optical system by use of

the light from the optical path difference applying optical system which passes a pinhole and the projection optical system. The pinhole has a diameter which is smaller than a diameter of an Airy disc.

In another aspect of the present invention, independent claim 25 recites an exposure apparatus for exposing a substrate with a pattern of an original. The apparatus includes a projection optical system for projecting the pattern of the original onto the substrate with light from a light source, an optical path difference applying optical system for dividing light from the light source into two light beams and for re-combining the two light beams, and a photosensitive element for detecting light from the optical path difference applying optical system which passes a pinhole and the projection optical system as an interference signal. The pinhole has a diameter which is smaller than a diameter of an Airy disc.

In still another aspect of the present invention, independent claim 26 recites a device manufacturing method including the steps of exposing a substrate with a pattern of an original by use of an exposure apparatus, and developing the exposed substrate. The exposure apparatus includes (i) a projection optical system for projecting the pattern of the original onto the substrate with light from a light source, (ii) an optical path difference applying optical system for dividing light from the light source into two light beams and for re-combining the two light beams, and (iii) an interferometer for measuring an optical characteristic of the projection optical system by use of light from the optical path difference applying optical system which passes a pinhole and the projection optical system. The pinhole has a diameter which is smaller than a diameter of an Airy disc.

By such an arrangement, in the present invention, any difference between wavefronts of two divided light beams, for example, divided by the optical path difference applying optical system can be made small. This arrangement provides significant advantages, such as enabling a more exact determination of aberration. Such features of the invention are discussed in more detail in the subject specification on page 6 at lines 2-8.

Applicant submits that the cited art does not teach or suggest such features of the present invention, as recited in independent claims 21, 25 and 26.

The Murakami et al. patent relates to a projection exposure apparatus that includes an optical system for illuminating a pattern formed on a first object, with light, a projection optical system for projecting the pattern of the first object, illuminated by the illumination optical system, onto a second object for exposure of the second object with the pattern, a main system including the illumination optical system and the projection optical system, and an interferometer for use in measurement of an optical characteristic of the projection optical system and being mounted on the main system.

In more detail, the Murakami et al. patent shows, in Figure 1, the structure of an interferometer for measurement of a wavefront of a projection optical system, in which, as an example, a Fizeau type interferometer is provided at the reticle side. In that arrangement, however, light from the interferometer light source 6 does not pass through an optical path difference applying optical system, in the manner of the present invention recited in independent claims 21, 25 and 26. Still further, in the Murakami et al. patent, as discussed at column 3, lines 18-22, an argon laser beam goes via a mirror and then through condenser system 7 and a pinhole

8, in which the diameter of the pinhole 8 is set to be approximately the same as an Airy disc determined by the numerical aperture of a collimator lens 9, which transforms the laser beam into a parallel beam. The reason for this, in the Murakami et al. patent, is so that the light beam emitted from the pinhole 8 comprises a substantially idealistically spherical wave. Accordingly, the pinhole diameter of the device in the Murakami et al. patent is significantly larger than the pinhole diameter in the present invention, which, as recited in independent claims 21, 25 and 26, is smaller than a diameter of an Airy disc.

In short, therefore, in the device in the Murakami et al. patent, the light from the interferometer light source 6 does not go through any optical path difference applying optical system, in the manner of the present invention recited in the independent claims. Accordingly, there would be no reason, based on the fair of teachings of the Murakami et al. patent, to make the pinhole 8 diameter to be smaller than the Airy disc. Rather, in the Murakami et al. patent, as discussed above, the spherical wave to be produced by the pinhole 8 should have a diameter the same as that of the Airy disc. Accordingly, Applicant submits that the Murakami et al. patent does not teach or suggest at least the features of the optical path difference applying optical system or the particular diameter of the pinhole, of the present invention, as recited in independent claims 21, 25 and 26.

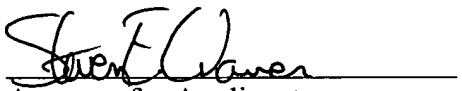
For the foregoing reasons, Applicant submits that the present invention, as recited in independent claims 21, 25 and 26, is patentably defined over the cited art.

Dependent claims 22-24 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in independent claim 21. Further individual consideration of these dependent claims is requested.

Applicant further submits that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the rejection set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,



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